Operational Photovoltaic and Solar Energy Applications

Richard Perez

Because it is continuous in time and in space, and because it is site and time specific, satellite-derived solar resource assessment information adds a new dimension to the investigation of the operational performance of solar energy system. Sometimes, this added dimension provides a new insight that can have a substantial impact on the assessment of the feasibility and the value of these systems.

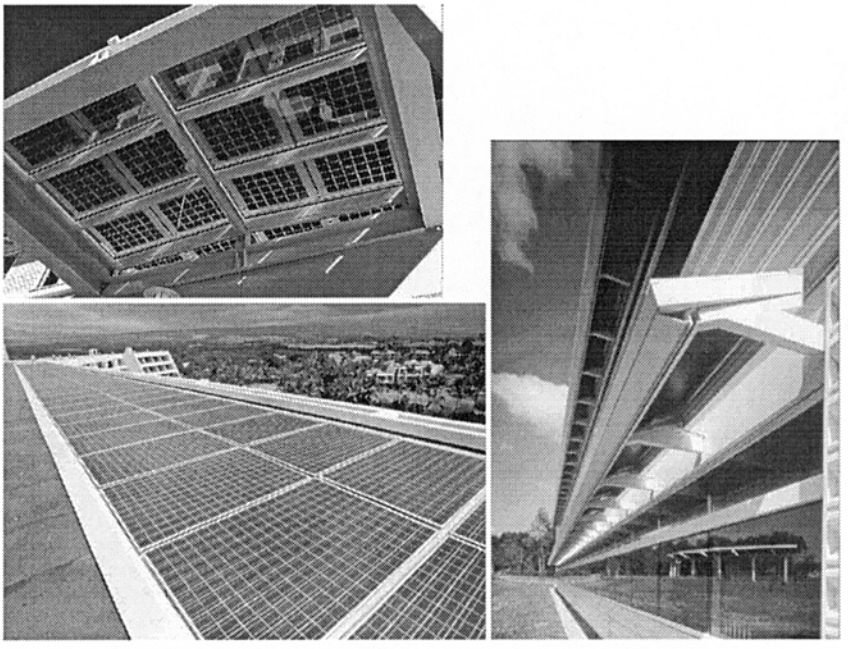
Two examples where access to the satellite resource made a substantial difference are presented:

(1) The first example is the determination of the effective capacity of photovoltaics and the resulting impact on the geographical distribution of PV markets for commercial applications.

(2) The second example includes case studies assessing the ability of PVs to help prevent and/or to relieve the effects of regional or localized power outages.

OPERATIONAL PV AND SOLAR ENERGY APPLICATIONS

Richard Perez



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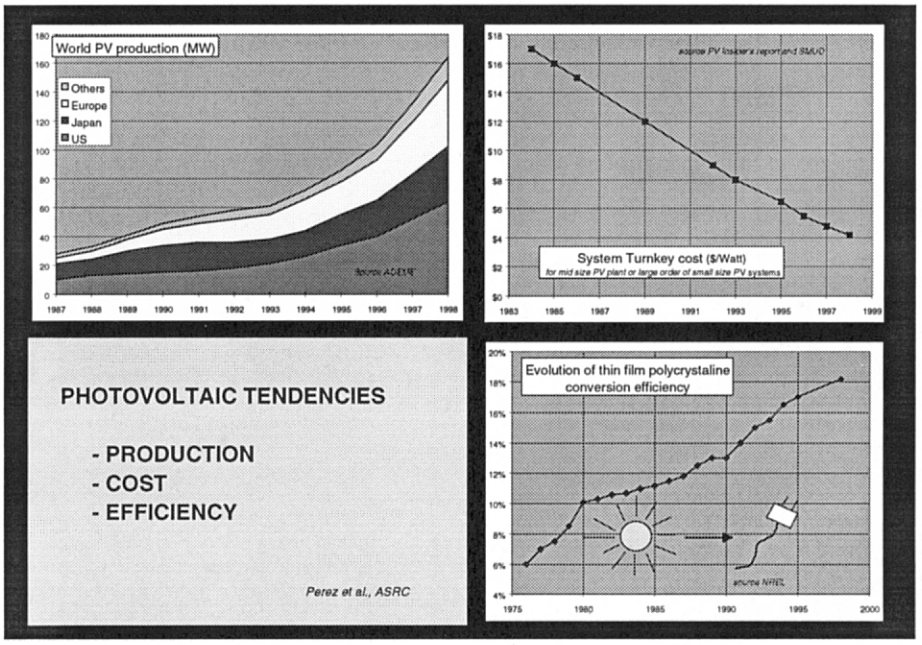
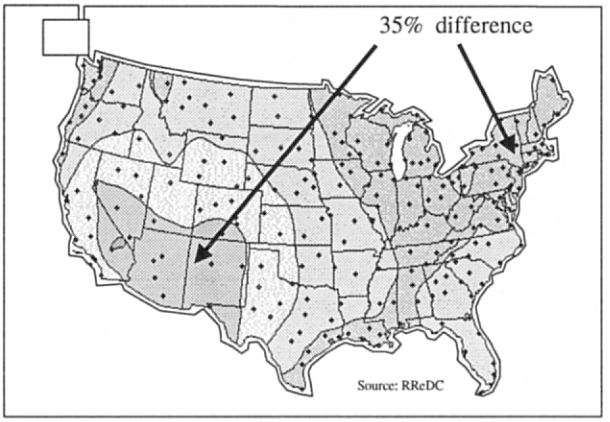


Common misconceptions about PVs in the northeast

- No Sun



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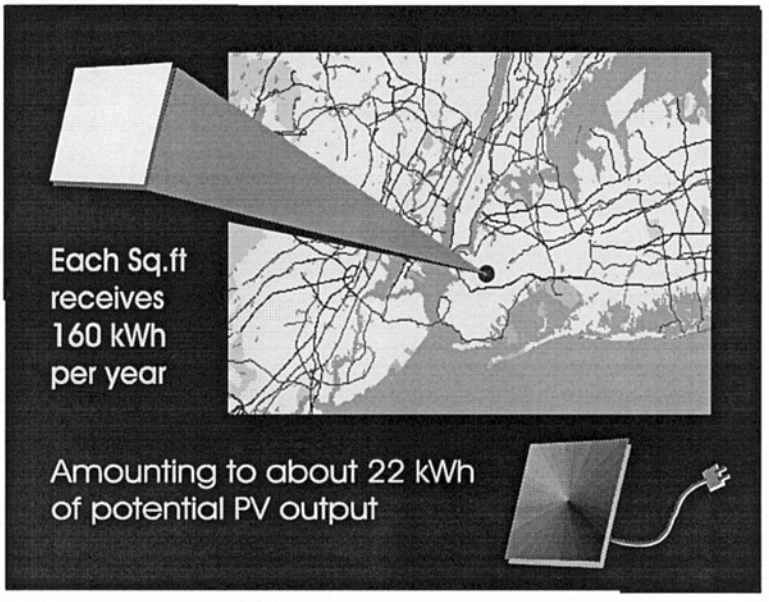
Common misconceptions about PVs in the northeast

- No Sun
- No Space

Perez et al., ASRC



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Common misconceptions about PVs in the northeast

- No space
- No sun
- **No reliability**
- **Too Expensive**

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PV Reliability

- **Effective capacity**
  Delivering power when needed
- **Performance in emergency situations**
  Solution to power outages

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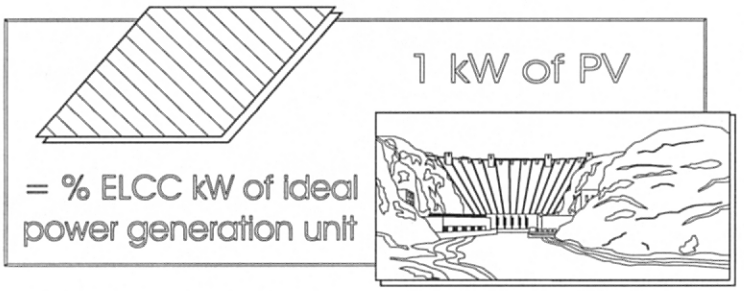
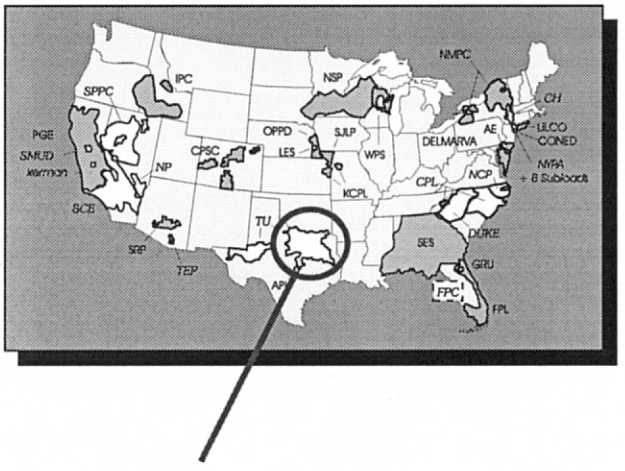
Effective Capacity
% ELCC *



e.g., 100 kW of PV with 80% effective capacity amounts to 80 kW of ideal power generation

Perez et al., ASRC

* ***E**ffective **L**oad **C**arrying **C**apability*
Increase in available capacity at constant LOLP



Solar Radiation Data
Arbitrary location
Arbitrary time, past, current (and forecast)

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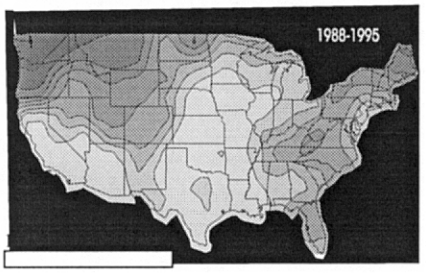
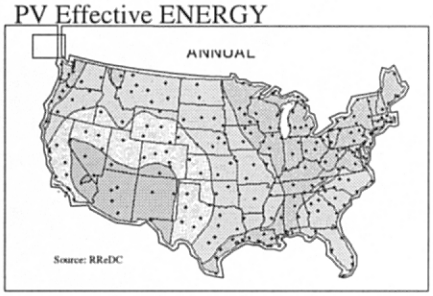
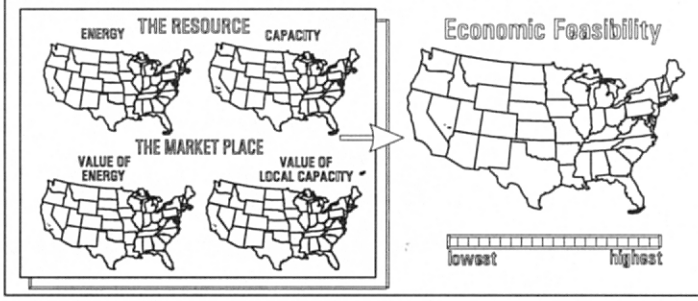
PV Effective CAPACITY



PV Effective ENERGY



Market implications



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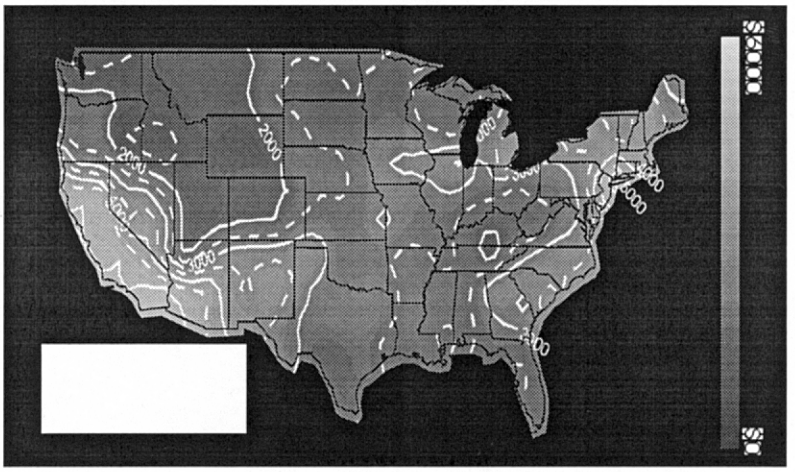

COMMERCIAL DEMAND-SIDE PV

BREAKEVEN TURNKEY PV SYSTEM COST (2-axis trk. Systems)

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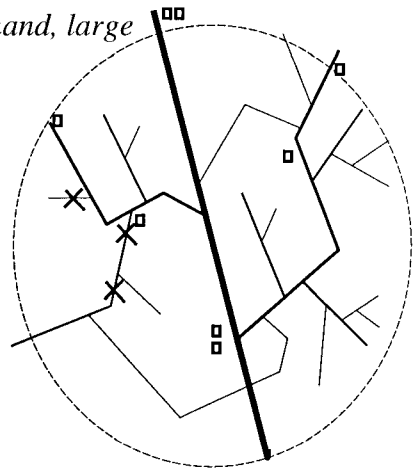
POWER OUTAGES

- **Regional Grid-wide Blackouts (Brownouts)** *Causes: High demand, large power transfers, cascading effects*
- **Localized Power Line outages** *Causes: severe weather*



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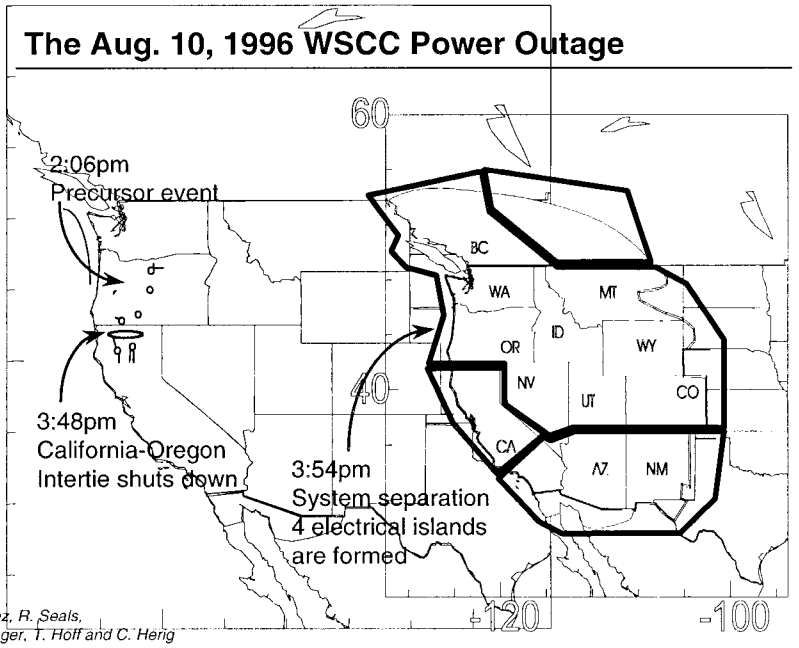

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